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IMPROVEMENTS IN METHODS OF PICKLING OLIVES

BY
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IMPROVEMENTS IN METHODS OF PICKLING OLIVES

BY

FREDERIC T. BIOLETTI and W. V. CRUESS

I. EXTRACTION AND DARKENING OF RIPE OLIVES

Defects of Present Methods.—In most Californian factories, ripe olives are first treated with a lye which is allowed to penetrate the skin and a short way into the flesh. This lye is then drained off and the olives are exposed to the air to darken. When the desired color is reached, a second lye is applied and allowed to reach the pit to destroy the bitterness. This lye is then washed out with water, which is changed frequently. There are many variations of this general process. Some factories use several lyes and several exposures to the air. The strengths of lye used vary greatly. But in general, the process most in use is one of exposure to air to darken the color after a first lye treatment, followed by one or more lye treatments to destroy the bitterness and repeated soakings in water to remove the lye.

Exposure to air produces other effects besides darkening the color. It toughens the flesh and injures the flavor. The darkening, which is desirable if confined to the outer parts of the olive, may extend to all the flesh, where it is unattractive. Desirable qualities in a ripe picked olive are: Dark color (localized near the skin), light colored flesh (tender, but not soft), "freestone" pits (i. e., separating easily from the flesh), and a rich flavor, not "scorched" nor "oxidized." It is very difficult to obtain all of these qualities by the "exposure" method, even if ripe fruit is used and it is impossible with underripe fruit. The method is lengthy, usually requiring several weeks.

Theory of Air Exposure.—In the usual methods, the olives are first bleached by the lye and then darkened by direct exposure to the air. The darkening is evidently due to the oxygen of the air. If oxygen were supplied in some other way, while the olives remained in the liquid, darkening should occur equally.

This principle has long been applied in the old method of removing the lye and bitterness by running water. The olives are darkened by the air dissolved naturally in the water, but the process is slow. The stirring of olives in the pickling vats with compressed air, as is

done in many factories, also darkens the olives somewhat, but as at present practised the darkening is slow and imperfect.

New Method A.—Laboratory experiments at the University, extending over several years, and recent factory tests,* have demonstrated that the continual movement of the liquids and their continual aeration can be combined with good effects. The dissolved and occluded oxygen darkens the color and the flowing liquid equalizes and hastens the action of the lye, water, or brine. Water treated and used in this way greatly increases the rate of darkening and of the removal of the lye and bitterness.

The quality of olives treated by this method was superior to that of the same olives treated in the usual way, and the time was shortened, both in laboratory and factory tests, to 72 hours, for the whole process from fresh olive to finished product.

The best and most economical installation for applying this method can be developed only in actual practice, but a workable device is shown in Figure A.

The olives are first placed in the vats *g, g,* which can be probably be of any convenient size. They are then covered with lye (2 ounces per gallon) which has been heated to 75° or 80° F. Some of the same lye is placed in the sump *a*. The rotary pump *d* is then started and the warm lye forced from the sump through the pipes leading to the bottoms of the vats of olives. The small pet cock *c* is opened at the same time. This allows air to be drawn into the liquid by the suction of the pump.

The lye passes up through the olives and overflows through the outlets *h* to the return pipe *j,* and back to the sump *a,* where the cycle recommences. This circulation is kept up until the lye has penetrated to the pit. The lye is then drawn off and replaced with water which is caused to circulate through the system in the same way. The pet cock *c* is kept open. Air is drawn in and mixes intimately with the water in the pump and pipes. The aerated water which is kept at 75° to 90° F. by the steam jacket *e* rapidly darkens the olives and washes out the lye. The water should changed at least twice a day. When the lye has been washed out and the color sufficiently darkened, the olives are placed in cans. Brine is then added and the cans exhausted, sealed, and processed in the usual way.

This method may be modified by using two lye solutions, the first just entering the skin and the second reaching to the pit. Each lye

*Factory tests of Method A were made at the works of Hunt Bros Co., who supplied the necessary facilities. The successful carrying out of both the laboratory and factory work was due in great part to the efficient assistance of Mr. J. R. Zion.

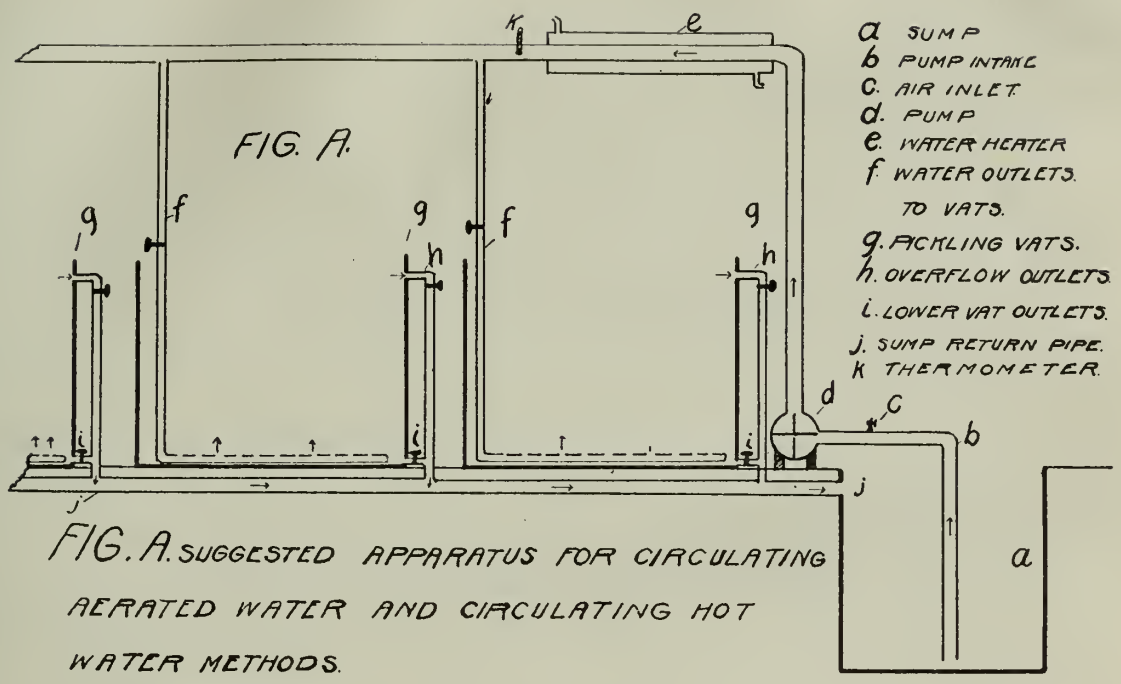

FIG. A. SUGGESTED APPARATUS FOR CIRCULATING AERATED WATER AND CIRCULATING HOT WATER METHODS.

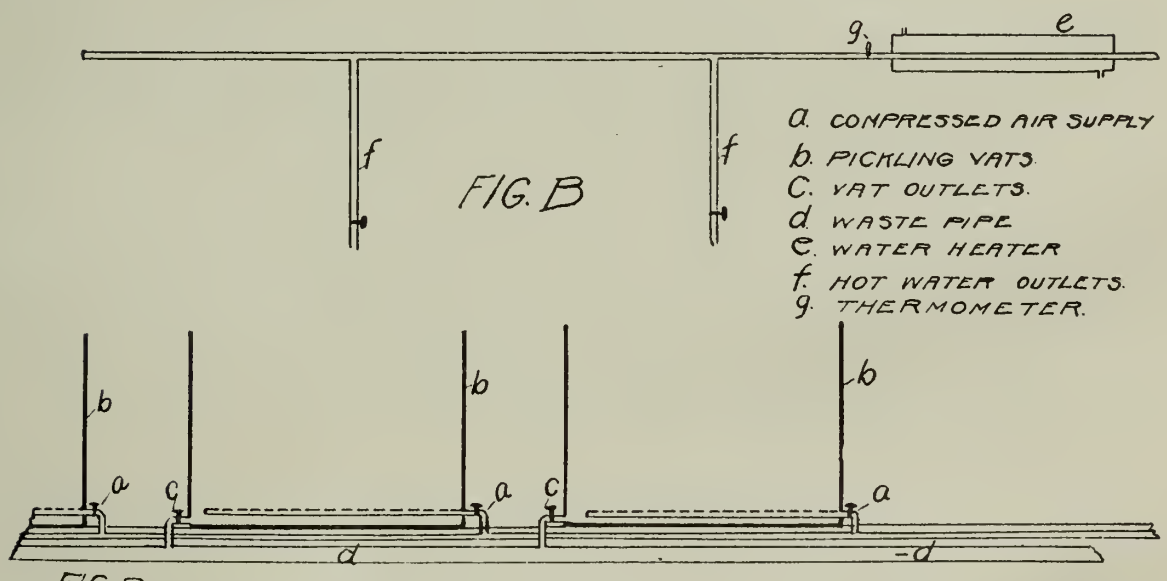

FIG. B SKETCH OF APPARATUS SUGGESTED FOR COMBINED USE OF HOT WATER AND COMPRESSED AIR.

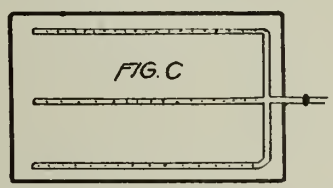

FIG. C. PLAN OF DISTRIBUTION OF COMPRESSED AIR FOR METHOD B

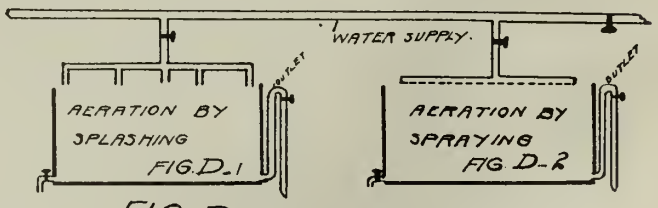

FIG. D TWO OTHER METHODS OF DELIVERING AND AERATING LIQUIDS IN METHOD A.

solution is followed by circulating aerated water, the first until the olives are sufficiently darkened, the second until all lye and bitterness have been removed. This method requires more time than the single lye treatment and seems to have no advantage over it.

Other methods of aeration may be substituted for the air inlet *c*. In that of *Figure D-1,* the liquid is aerated by allowing it to splash into the vat; in that of Figure *D-2,* by spraying through fine openings in the outlet pipe. The method of Figure *A,* however, seems to be the most simple, thorough, and easily regulated.

New Method B.—The underlying principles of this method are high temperature and circulating liquid. The same apparatus may be used as for Method A. The water and lye are caused to circulate as in Method A, but the pet cock *c* is kept closed and no attempt is made to aerate the liquids. A lye of 2 ounces per gallon is used at approximately 100° to 110° F. When the lye reaches the pit it is removed and replaced by water. The water is heated to between 100° and 175° F., by the heater *e* and kept at this temperature. It is pumped continuously until the proper color is reached and the lye removed.

This method gave better results on a laboratory scale than Method A, but was not tested on a factory scale. It is recommended for trial by factories this season in preference to Method A.

The heating device shown is an improvised steam jacket around the water supply pipe. For experimental purposes, hot water from a tank may be used and allowed to go to waste as it overflows from the pickling vat, but for factory installations, the water should be used repeatedly to avoid the excessive cost of operation due to the large quantity of water used.

New Method C.—In this process, an apparatus such as that shown in Figure B is used. The principles involved are aeration by compressed air and use of hot standing liquid. The olives are placed in the vats *b, b.* A lye of two ounces per gallon at 100° to 110° F. is then added. Compressed air from the perforated pipes *a, a,* is passed continuously through the olives and the lye is allowed to reach the pits. The lye is then replaced by water at 100° to 185° F., from the pipes *f, f.* Compressed air is then passed as before, through the liquid and olives from the pipes *a, a* (see also *Figure C*). The water is replaced by fresh hot water from *f, f* as it cools. It should be maintained at 120° to 150° F., or above. The water is not caused to circulate, but is agitated violently by the air jets.

This process also has been tested on a laboratory scale only, but is strongly recommended for trial experimentally by factories already

equipped with compressed air. It did not work quite so rapidly as methods A and B, but gave excellent results.

New Method D.—This method combines the three principles of aeration and circulation of liquid, and high temperature. The apparatus of *Figure A* is used. The method is the same as Method A, except that the temperature is maintained at 100° to 175° F. The air cock *c* is left open or the liquid is aerated by devices shown in Figures D-1 and D-2.

This method is very rapid and probably the best of the four suggested.

FERMENTATION OF PICKLED OLIVES

The green pickled olives of commerce usually known as "Queen" olives are prepared by a fermentation process. This fermentation produces lactic acid which gives them their peculiar piquancy and helps to preserve them.

Experiments at the University have shown that pickles practically identical in character and quality with the imported Queen olives can be produced in California from the Sevillano and Mission varieties. The Manzanillo can be prepared successfully in the same way.

Other experiments have shown that this pickling process can be applied successfully to ripe olives, at least to the Ascolano variety.

It has been shown also that ripe olives, pickled in the usual way, or by the methods described here can be given the piquant quality by a supplementary fermentation.

Green Olives.—The olives are picked after they have reached a good size, but before they show any sign of coloring, either red or yellow.

They are placed in a 2% lye (2½ ounces of lye per gallon of water) and left until the lye reaches the pit. The lye is then replaced by water changed twice daily until all taste of lye has disappeared.

They are then placed in 7% brine (9 ounces of salt per gallon of water).

All these operations should be carried out with as little exposure of the fruit to the air as possible.

The olives are kept in the brine in closed receptacles at ordinary room temperatures until fermentation has developed the characteristic flavor and acidity. This will require from three weeks to several months, according to the temperature and to the amount of flavor desired.

When the fermentation has reached the desired point, the brine is taken off, strained, or filtered, and boiled. The olives are rinsed

quickly with water and then covered with the hot brine. They may be kept in barrels, or preserving jars without further treatment.

If intended for shipment or to be kept for a long time, they may be placed in glass preserving jars or lacquered cans. These are then filled with the boiling brine, sealed, and heated at 212° F. for about 20 minutes.

Ripe Olives of Green Color.—The Ascolano olive gathered just as it was turning cherry red, the stage of ripeness considered best for ripe olives, was pickled by the fermentation method just described. The result was a light greenish yellow pickle with white flesh, crisp, and of excellent flavor. It had none of the fibrous character of many green olives and was considered much superior by everyone who tasted them. It is probable, that olives of any variety could be prepared in the same way, provided they had not become black. The method offers a simple method of producing a new kind of pickled olive that might be preferred to either the green or the black.

Fermented Ripe Olives of Black Color.—Ripe olives which have been pickled in any of the ordinary ways may be subjected to a fermentation that gives them some of the sprightliness of the green olives and improves them to many tastes.

When the ripe olives have been pickled and are ready to can, they are placed in a 7% brine and allowed to ferment in exactly the same way as described for green olives. The fermentation bleaches the olives a little, but they can be darkened by exposing to the air for a day or two. They may be packed in the filtered and boiled brine like the green olives, but the best results are obtained by putting them in lacquered cans or glass jars without liquid. They are first heated with boiling brine, the brine poured off, and then, after sealing, the cans are sterilized 30 minutes and the jars 40 minutes at 212° F.

At present, we have two main types of pickled olives: That represented by the green Spanish "Queen" olives and that represented by the Californian black ripe olives. The latter is more nutritious and wholesome, while the former has a sprightliness of flavor relished by many. The green olive is hard, tough, and indigestible; the ripe often flat and insipid to many tastes.

The two methods of pickling ripe olives by fermentation described here combine the good qualities of both types and avoid their defects. The second method yields a black olive, and the first, one, which while equally ripe and wholesome, is green or whitish in color. The first is simply a probable improvement of our present type of ripe olives, but the second produces an entirely new type.